Table 1. Island of occurrence, number, prevalence, mean intensity, range, and mean abundance of helminths in 62 *Anolis cristatellus* from the British Virgin Islands.

Island Helminth	No. lizards	No. helminths	Prevalence (%)	Mean Intensity $\bar{x} \pm SD$	Mean Intensity Range	Mean Abundance ($\bar{x} \pm SD$)
Anegada	6					
Parapharyngodon cubensis		8	67	2.0 ± 1.4	1–4	1.3 ± 1.5
Porrocaecum sp. (larvae)		4	33	2.0 ± 1.4	1–3	0.7 ± 1.2
Centrorhynchus sp. (cystacanths)		20	17	20.0		3.3 ± 8.2
Beef	8					
Parapharyngodon cubensis		16	50	4.0 ± 2.2	2–7	2.0 ± 2.5
Spauligodon anolis		99	38	33.0 ± 32.1	12–70	12.4 ± 24.2
Trichospirura teixeirai		5	25	2.5 ± 2.1	1–4	0.6 ± 1.4
Porrocaecum sp. (larvae)		4	25	2.0		0.5 ± 0.9
Centrorhynchus sp. (cystacanths)		3	13	3.0		0.4 ± 1.1
Oligacanthorhynchidae (cystacanths)		8	38	2.7 ± 1.2	2–4	1.0 ± 1.5
Guana	3					
Parapharyngodon cubensis		8	67	4.0 ± 2.8	2–6	2.7 ± 3.1
Porrocaecum sp. (larvae)		8	67	4.0 ± 4.2	1–7	2.7 ± 3.8
Centrorhynchus sp. (cystacanths)		3	67	1.5 ± 0.7	1–2	1.0 ± 1.0
Necker	12					
Parapharyngodon cubensis		24	83	2.4 ± 2.2	1–8	2.0 ± 2.2
Trichospirura teixeirai		1	8	1.0		0.8 ± 0.3
Physaloptera sp. (larva)		1	8	1.0		0.8 ± 0.3
Porrocaecum sp. (larvae)		77	83	7.7 ± 8.0	2–28	6.4 ± 7.8
Centrorhynchus sp. (cystacanths)		8	25	2.7 ± 1.2	2–4	0.7 ± 1.3
Oligacanthorhynchidae (cystacanth)		1	8	1.0		0.1 ± 0.3
Norman	12					
Parapharyngodon cubensis		8	58	1.1 ± 0.4	1–2	0.7 ± 0.6
Porrocaecum sp. (larva)		1	8	1.0		0.1 ± 0.3
Centrorhynchus sp. (cystacanths)		60	75	6.6 ± 3.4	2–11	5.0 ± 4.2
Tortola	11					
Oochoristica maccoyi		1	9	1.0		0.1 ± 0.3
Parapharyngodon cubensis		20	55	3.3 ± 2.5	1–7	1.8 ± 2.5
Trichospirura teixeirai		8	27	2.7 ± 2.9	1–6	0.7 ± 1.8
Porrocaecum sp. (larvae)		13	27	4.3 ± 2.9	1–6	1.2 ± 2.4
Rhabdias sp.		2	18	1.0		0.2 ± 0.4
Centrorhynchus sp. (cystacanths)		27	36	6.8 ± 6.9	2–17	2.5 ± 5.1
Oligacanthorhynchidae (cystacanths)		2	18	1.0		0.2 ± 0.4
Virgin Gorda	10					
Mesocoelium monas		72	60	12.0 ± 6.3	5–23	7.2 ± 7.8
Parapharyngodon cubensis		18	80	2.3 ± 1.3	1–4	1.8 ± 1.5
Trichospirura teixeirai		4	10	4.0		0.4 ± 1.3
Porrocaecum sp. (larvae)		137	90	15.2 ± 25.0	1–77	13.7 ± 24.1
Centrorhynchus sp. (cystacanth)		1	10	1.0		0.1 ± 0.3
Oligacanthorhynchidae (cystacanths)		25	60	4.2 ± 5.1	1–14	2.5 ± 4.4

loptera sp. and *Porrocaecum* sp., and 2 species of acanthocephalans represented by cystacanths, *Centrorhynchus* sp. and an unidentified oligacanthorhynchid acanthocephalan. The specimens of *Rhabdias* sp. had damaged anterior regions and could not be identified to species. *Anolis cristatellus* represents a new host record for *O. maccoyi, T. teixeirai, Physaloptera* sp., *Porrocaecum* sp., and the oligacanthorhynchid cystacanths.

Representative helminths were placed in vials of alcohol and deposited in the U.S. National Parasite Collection (USNPC) Beltsville, Maryland: *Mesocoelium monas* 87534; *Parapharyngodon cubensis* 87535; *Spauligodon anolis* 87536; *Trichospirura teixeirai* 87537; *Physaloptera* sp.

87538; *Porrocaecum* sp. 87539; *Rhabdias* sp. 87540; *Centrorhynchus* sp. (cystacanths) 87541; oligacanthorhynchid cystacanths 87542.

Helminths were site specific. *Mesocoelium monas* and *O. maccoyi* were found in the small intestine. *Parapharyngodon cubensis* and *S. anolis* occurred in the large intestine. *Trichospirura teixeirai* was found in the gallbladder. *Rhabdias* sp. occurred in the lungs. The larva of *Physaloptera* sp. was found free in the stomach. Larvae of *Porrocaecum* sp., cystacanths of *Centrorhynchus* sp., and the unidentified oligacanthorhynchid acanthocephalan were encysted in the peritoneum of the coelom. The walls of these connective tissue cysts were constructed of several layers of fibrocytes and surrounding fibers.

Island of occurrence, number of lizards, number of helminths, prevalence, mean intensity, range, and mean abundance are presented in Table 1. Three helminth species were found on all islands, i.e., *Parapharyngodon cubensis, Porrocaecum* sp., and *Centrorhynchus* sp. There was no significant difference among prevalences by island for *Parapharyngodon cubensis* ($\chi^2 = 4.35$, 6 df, $P > 0.05$), but significant differences were found among prevalences by island for *Porrocaecum* sp. ($\chi^2 = 25.18$, 6 df, $P < 0.001$) and *Centrorhynchus* sp. ($\chi^2 = 15.92$, 6 df, $P < 0.05$). More anoles will need to be examined before the distribution differences for helminth species shown in Table 1 can be explained.

All helminths found in the present study are known from other anole hosts (Acholonu, 1976; Goldberg et al., 1997a, b; Torres Ortiz, 1980). These helminths fall into 2 groups: 1) species for which anoles are definitive hosts, i.e., *M. monas, O. maccoyi, Parapharyngodon cubensis, S. anolis, T. teixeirai,* and *Rhabdias* sp., and 2) species for which anoles are paratenic hosts, i.e., helminths occur only as immature stages and have no chance of completing their life cycles: *Porrocaecum* sp., *Centrorhynchus* sp., and oligacanthorhynchid cystacanths.

The only other populations of *A. cristatellus* examined for helminths are from Puerto Rico. Three species of trematodes, *Allopharynx puertoricensis, A. riopedrensis,* and *M. monas*; 4 species of nematodes, *Befilaria puertoricensis, S. anolis* (=*Pharyngodon anolis* sensu Acholonu, 1976), *Parapharyngodon cubensis* (=*Pharyngodon travassosi* sensu Acholonu, 1976), and *Rhabdias* sp.; and 2 species of acanthocephalans, *Centrorhynchus* sp. and *Lueheia inscripta,* have been reported from these populations (Chitwood, 1934; Cofresí-Sala, 1964; García-Díaz, 1966, Bain and Chaniotis, 1975; Acholonu, 1976; Torres Ortiz, 1980). Thus, British Virgin Island and Puerto Rican populations of *A. cristatellus* currently have 5 helminth species in common: *M. monas, S. anolis, Parapharyngodon cubensis, Rhabdias* sp., and *Centrorhynchus* sp. Because sample sizes for the populations of *A. cristatellus* examined to date have been small, more individuals will need to be examined before biogeographic patterns of the various helminth species can be evaluated.

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Research Note

Prevalence and Distribution of Cystacanths of an Oligacanthorhynchid Acanthocephalan from the Longnose Snake, *Rhinocheilus lecontei* (Colubridae), in Southwestern North America

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ABSTRACT: Cystacanths of an oligacanthorhynchid acanthocephalan were found in 161 of 554 (29%) *Rhinocheilus lecontei* from southwestern North America: Arizona, 134/311 (43%); California, 4/107 (4%); Texas, 2/23 (9%); Mexico, 21/53 (40%). No cystacanths were found in *R. lecontei* from Nevada (0/42), New Mexico (0/17), or Utah (0/1). Infections varied from few cystacanths to many cystacanths per snake, but a tissue inflammatory reaction was not observed. The geographic distribution of oligacanthorhynchid cystacanths in *R. lecontei* suggests that these cystacanths are most prevalent in Arizona and Mexico.

KEY WORDS: Acanthocephala, oligacanthorhynchid cystacanths, snake, *Rhinocheilus lecontei*, Colubridae.

Juvenile stages of oligacanthorhynchid acanthocephalans have been found in amphibians (Moore, 1946), reptiles (Elkins and Nickol, 1983; McAllister et al., 1991, 1995; McAllister, 1992; Stuart and Miller, 1993; Bolette, 1997a, b), and mammals (Elkins and Nickol, 1983; Radomski et al., 1991). Elkins and Nickol (1983) and Bolette (1997a, b) considered reptiles in these instances to be paratenic hosts. Juvenile stages of oligacanthorhynchid acanthocephalans have also been recovered from reptiles in experimental procedures (Elkins and Nickol, 1983; Fahnestock, 1985).

The longnose snake, *Rhinocheilus lecontei* Baird and Girard, 1853, occurs from central Texas, southeastern Colorado, and southwest Idaho through southern California to central Baja California and in Mexico to San Luis Potosí and southern Tamaulipas at elevations from below sea level to around 1,650 m (Stebbins, 1985). *Rhinocheilus lecontei* is nocturnal and is active primarily in the spring (Klauber, 1941). Although its biology has been summarized by Medica (1975), the only information on parasites from this snake is from Bolette (1997b), who reported oligacanthorhynchid cystacanths from a single *R. lecontei* from Maricopa County, Arizona. The purpose of this note is to present prevalence and distribution data for oligacanthorhynchid cystacanths from populations of *R. lecontei* collected in southwestern North America.

Five hundred fifty-four *R. lecontei* were obtained from museum collections: 168 from Arizona State University (ASU), 194 from the Natural History Museum of Los Angeles County (LACM), and 192 from the University of Arizona (UAZ). These snakes were collected March–September 1939–1987. At the time of capture, the snakes were fixed in 10% formalin and then stored in 70% ethanol (ASU, LACM) or isopropanol (UAZ). A midventral incision was made in the body wall and the caudal portion of the body cavity and those organ surfaces

and mesenteries were visually checked for structure and appearance. Oblong whitish bodies, approximately 1 × 3 mm, were frequently seen; microscopic examination revealed encysted oligacanthorhynchid acanthocephalan cystacanths. Five cystacanths and surrounding tissues were embedded in paraffin by standard histological methods, sectioned at 5 μm, and stained with hematoxylin and eosin. Forty cystacanths were cleared in glycerol, and 20 cystacanths were bisected along the midlateral longitudinal plane and cleared in lactophenol. Voucher specimens were deposited in the U.S. National Parasite collection, Beltsville, Maryland (USNPC 86924). Terminology usage follows Bush et al. (1997).

Cystacanths were slightly flattened and somewhat annulated. The retracted proboscis was spherical and supported 36 hooks, 6 circles of 6 rows each. Hooks of the second circle were largest, and hooks of other circles progressively decreased in size. All hooks had distinctly asymmetrical roots, and the anterior root of hooks of the first, second, and third circles exhibited bifurcation to various degrees. Infections ranged from a few to many cystacanths per snake.

In section, cystacanths were surrounded by a delicate membranous envelope composed of flattened to low cuboidal mesothelial-type cells associated with a very thin collagenous stroma. There was no tissue inflammatory reaction in the host's tissue surrounding the cystacanth. No necrotic or calcified cystacanths were found.

One hundred sixty-one of the 554 (29%) *R. lecontei* were infected: males, 111/360; females, 48/161; juveniles, 2/33. There was no significant difference in infection rate between adult male and female snakes ($\chi^2 = 0.08$, 1 df, $P > 0.05$). There was a significant difference between adult and juvenile snakes ($\chi^2 = 9.11$, 1 df, $P < 0.001$); adults were more frequently infected.

Prevalence of cystacanths for *R. lecontei* examined in this study is listed by county for the United States and by state for Mexico in Table 1, and the distribution is plotted in Figure 1. Infection rates were not uniform across the range of *R. lecontei*. Heaviest infections occurred in central Arizona and northern Mexico. Infection prevalences of oligacanthorhynchid cystacanths in *R. lecontei* for Arizona were 134/311 (43%), for California were 4/107 (4%), for Texas were 2/23 (9%), and for Mexico were 21/53 (40%). In California, cystacanths were found only in

Table 1. Prevalence of oligacanthorhynchid cystacanths in *Rhinocheilus lecontei*.

State County	No. infected/ total snakes	Prevalence (%)
Arizona		
Cochise	9/30	30
Gila	5/10	50
Graham	2/5	40
Maricopa	18/77	23
Mohave	2/8	25
Pima	46/92	50
Pinal	44/68	65
Santa Cruz	3/11	27
Yavapai	5/8	63
Yuma	0/2	0
California		
Fresno	0/1	0
Imperial	0/4	0
Inyo	0/3	0
Kern	0/10	0
Los Angeles	0/4	0
Riverside	4/55	7
San Bernadino	0/14	0
San Diego	0/16	0
Nevada		
Nye	0/37	0
Clark	0/3	0
Lincoln	0/2	0
New Mexico		
Bernalillo	0/1	0
Doña Ana	0/5	0
Eddy	0/1	0
Hidalgo	0/1	0
Luna	0/1	0
Quay	0/1	0
San Miguel	0/2	0
Socorro	0/5	0
Texas		
Brewster	2/9	22
Coryell	0/1	0
Hudspeth	0/3	0
Llano	0/2	0
McLennan	0/1	0
Tom Green	0/3	0
Travis	0/1	0
Webb	0/1	0
Wise	0/1	0
Val Verde	0/1	0
Utah		
Washington	0/1	0
Mexico		
Baja California del Norte	1/8	13
Chihuahua	2/2	100
Coahuila	5/9	56
Durango	2/2	100
Sinaloa	2/6	33
Sonora	9/26	35